The intra-session reliability in defining the extent and the location of pain during ULNT1: a study on healthy volunteers

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Background: Pain Drawing (PD)

- Pain Extent: how “large” is the pain
- Pain Location: where is the pain
Background

• Describe pain patterns in specific pathological conditions

• Assess pain changes during time

  **BUT…**

• Lack of data on pain drawing reliability
Aim

- Investigate the consistency of two consecutive pain drawings in defining the extent and the location of pain after an acute painful stimulus.
Methods

Upper Limb Neurodynamic Test 1 (ULNT1)
(Butler 1991)

- 43 healthy volunteers mean age 27±8 (15 male age 28±8, 28 female age 26±8)
- Exclusion criteria: recent musculoskeletal disorders, neuro-cognitive disorders
- Inclusion criteria: full active RoM in neck, shoulder and upper limb joints
- Written information sheet, Signed informed consent, Ethical Approval obtained

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Materials

- Tablet & stylus pen
- PD analysis software

Body chart

1 dot ≈ 100 pxl

768 pxl
Experimental setup

- Hand-forearm splint + G4 sensors
- Goniometer software
- Polemus G4 antenna
- Pressure unit
- Wooden positioning device

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Procedure

PD instruction + procedure demonstration

ULTN1 performance (PO/SP)

PD1 acquisition

1 minute interval

PD2 acquisition

Standard task:
“Draw on the body chart where you felt pain, trying to be as precise as possible”
Analysis

Pain extent

• *Itraclass Correlation Coefficient – ICC*
  
  *Range: 0 to 1*
  
  0.00-0.25: *no correlation*
  
  0.26-0.49: *low correlation*
  
  0.50-0.69: *moderate correlation*
  
  0.70–0.89: *high correlation*
  
  0.90–1.00: *very high correlation* *(Munro, 2005)*

• *Bland-Altman plot*

Pain location

• *Jaccard Similarity Coefficient - JSC (Overlap)*
  
  *Range: 0 to 1*
  
  0 = *no overlap*
  
  1 = *complete overlap*
Analysis – Overlap & JSC *(example)*

PD1

Overlap PD1 and PD2

PD2

- **PD1 only**: 492 pxl
- **PD2 only**: 873 pxl
- **PD1 ∩ PD2**: 12630 pxl

**JSC** = \( \frac{12630}{12630 + 492 + 873} = 0.90 \)

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Results – Pain extent

<table>
<thead>
<tr>
<th></th>
<th>Mean Extent (pixel)</th>
<th>Standard Deviation=SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO</td>
<td>SP</td>
</tr>
<tr>
<td>Males (15)</td>
<td>2616 (SD=2000)</td>
<td>6243 (SD=4525)</td>
</tr>
<tr>
<td>Females (28)</td>
<td>4157 (SD=3108)</td>
<td>6407 (SD=4124)</td>
</tr>
</tbody>
</table>

- Pain extent at SP was significantly greater (CI:95%, p<0.05) than at PO
Results – Intraclass Correlation Coefficient

<table>
<thead>
<tr>
<th></th>
<th>PO</th>
<th>SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICC</td>
<td>0.980</td>
<td>0.976</td>
</tr>
</tbody>
</table>

95% confidence interval: upper and lower bound

- ICC is very high
Results – Bland-Altman plots

Pain onset

Submaximal pain

Average of PD1 and PD2

Difference between PD1 and PD2

Difference between PD1 and PD2

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Results – Jaccard Similarity Coefficient

<table>
<thead>
<tr>
<th></th>
<th>PO</th>
<th>SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>JSC</td>
<td>0.675 (SD=0.174)</td>
<td>0.710 (SD=0.174)</td>
</tr>
</tbody>
</table>

- JSC was significantly higher at SP than at PO (CI:95%, p<0.05)
Discussion

- ICC and B-A plots are indicative for a high reliability of pain extent.
- The extent difference (PD1−PD2) tends to increase with the extent value.
- The JSC is indicative for a good reliability of the location of pain.
- For pain location a JSC≥0.5 generally indicates a sufficient reliability.
Conclusions

• Pain drawing consistency in defining the extent and the location of pain was confirmed

• When using pain extent as an outcome measure consider the physiological “disagreement” between two consecutive acquisitions

• Pain location investigation could benefit also of a less severe/more clinical measure unit for pain location (pxl Vs body regions)

• Further research should investigate PD consistency in people with specific pathologic conditions
Acknowledgement

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Thanks for your attention!

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